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In developing a system for allocating manpower resources in the Navy, major emphasis has been placed on the design of an input-output (I/O) model to forecast the workload of shore activities based upon the size and distribution of the fleet. To determine the feasibility of I/O analysis for operational use, a full-scale model of the 11th Naval District is being developed. The structure of I/O analysis requires data on the work output of each shore activity and its destination in the fleet or other shore activities.

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A major effort is underway to collect and organize data for the empirical analysis of the fleet-shore workload demand network, focusing on 10 major shore activities in the 11th Naval District. This report is concerned with the analysis of workload demands on one of these activities--the Naval Air Station, Miramar.

The structure of demands on the three largest departments at NAS Miramar (Air Operations, Aircraft Intermediate Maintenance, and Supply) was analyzed. The differences in demand among aircraft types were determined for each of the three departments.

FOREWORD

This work was conducted in support of Navy Decision Coordinating Paper, Manpower Requirements Development System (NDCP-Z0109-PN) under subproject PN.06, Fleet Impact on Shore Requirements. The overall objective of this subproject is to apply econometric and manpower modelling technologies in the prediction and allocation of shore activity manpower resources as a function of workload and operational force levels. The main effort of FY77 is an empirical study of the demands that fleet and shore activities place on major shore activities in the 11th Naval District, with the objective of developing an input-output (I/O) model of the fleet support demand network. This study focuses on one of the major shore activities, the Naval Air Station, Miramar.

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J. J. CLARKIN
Commanding Officer

SUMMARY

Problem

A system for determining Navy manpower requirements and allocating manpower resources should be based on the workload and economic relations among individual shore-support activities. The demand network that links one shore activity to another, and to the fleet, constitutes the economic system of the Navy. To represent this network structure, an input-output (I/O) model of the 11th Naval District (11ND) is being developed to forecast the workload of shore activities, based on the size and distribution of the fleet. An I/O model of this size requires a significant effort to collect, organize, and analyze data on the source and intensity of demands.

Objective

The study analyzes workload demands placed on the Naval Air Station, Miramar (NAS Miramar) by fleet and shore activities. The results will be used in developing a full-scale model of the fleet-support demand network of the 11th Naval District.

Approach

The structure of demands on NAS Miramar was analyzed by using the following measures of workload on the three largest departments of the air base: air operations per month per aircraft, man-hours of intermediate maintenance per flight hour, and the number of supply requisitions per flight hour. The data were used to determine the distribution of workload in each department as a function of (1) the number of aircraft, (2) aircraft type, and (3) flight hours.

Findings

Demands by the squadrons that were home-based at NAS Miramar dominated the workload of the three major departments. Two aircraft types, the F-4 and F-14, accounted for 56 percent, 55 percent, and 64 percent, respectively, of the demands that Miramar home-based squadrons placed on the Air Operations Department, the Aircraft Intermediate Maintenance Department (AIMD), and the Supply Department.

Aircraft type and operating tempo (flight activity) significantly affected the workload at NAS Miramar. Different aircraft of the same type placed similar demands on Air Operations, AIMD, and Supply, and had similar flight hour activity. What variance did occur in demands by aircraft of the same type on AIMD and Supply was reduced significantly by taking operating tempo (flight hours) into consideration.

Conclusions

1. Data are available to measure demands on NAS Miramar in terms of air operations per month per aircraft for Air Operations, man-hours expended on repair per flight hour for AIMD, and requisitions per flight hour for Supply. These data will easily conform to an I/O framework.

2. Because aircraft type and the level of flight activity affected the demands placed on NAS Miramar, an I/O model that includes these demands must stress the resulting differences in workload.

3. Despite the large number and variety of aircraft customers, these can be aggregated into six aircraft types for an I/O model.

4. Since demands on NAS Miramar were significantly affected by the operating tempo of squadrons home-based there, changing squadrons' home-bases to or from NAS Miramar will alter the workload there. It is hoped that an I/O model will be able to quantitatively determine and predict the influence of a change in the mix of aircraft types home-based at NAS Miramar.

Recommendations

This analytic approach should be extended to include other major Naval jet bases, subject to data availability. To properly implement the Navy-wide I/O model, a close liaison with Commander Naval Air Force, Atlantic and Commander Naval Air Force, Pacific must be maintained to ensure that such a model accurately reflects the role of Naval Air Stations in the fleet support demand network.

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INTRODUCTION

Problem

The design of a system to determine manpower requirements and to allocate resources has emphasized the development of an input-output (I/O) model. The purpose of the model is to forecast the workload of shore activities based on the size and configuration of the fleet. These workload forecasts can then be used to derive manpower requirements. The I/O structure will link the activities of the fleet to each individual shore-support activity and will indicate linkages among shore-support activities. With the interconnections among fleet and shore activities identified, methods can be developed to quantitatively measure the effects of changing workload demand on the operating forces and shore-supporting activities.

The I/O model may be able to answer a wide variety of Navy management questions, such as:

1. For changes in the fleet's size or mix, what alterations in workload can be expected at each shore activity?

2. What is the impact of changes in the shore establishment on the level of fleet support?

3. If ships/squadrons are transferred from one homeport to another, what will be the effect on activities at each port?

An I/O model representing the fleet-support demand network of the 11th Naval District (11ND) is being developed for use by Navy managers. This model requires data on the output of each shore activity and on its destination in the fleet and at other shore activities. The demands by the fleet must be categorized by ship type and/or aircraft model, by movement, and by status. A large data base for an I/O model is essential; hence, current efforts are devoted to the collection, organization, and analysis of data for use in describing a fleet-support demand network.

Purpose

This data analysis effort concentrated on the workload demands placed on 10 shore activities in the 11th Naval District.[1] These activities were selected for their wide range of functions, outputs, and data problems; their manpower intensities; and their direct and indirect linkages to the fleet. Furthermore, they comprise about 42 percent of the total 11ND workforce.

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[1]The activities are the Naval Supply Center, San Diego; the Long Beach Naval Shipyard; the Naval Air Rework Facility, North Island; the Naval Regional Medical Center, San Diego; the Development and Training Center, San Diego; Naval Air Stations, North Island and Miramar; Naval Training Center, San Diego; Naval Station, San Diego; and the Public Works Center, San Diego. The first five studies have been completed; reports on these are listed in the Bibliography.

This report is an analysis of workload demand on one of these activities--the Naval Air Station (NAS), Miramar. NAS Miramar is responsible for providing support to the West Coast Fighter Squadron, the Light Photographic Reconnaissance Squadron, and the Airborne Early Warning Squardon, as well as to itself and to its other tenant activities. It is the major jet base in Southern California, and its inclusion in the proposed 11ND I/O model is of paramount importance. NAS Miramar currently employs over 1700 military and civilian personnel. Approximately 70 percent of them are employed in the three major departments: Air Operations, Aircraft Intermediate Maintenance (AIMD), and Supply.

APPROACH

Data Sources, Output Measures, and Initial Processing

Analysis of the workload demands placed on NAS Miramar required the pooling of several groups of data. Each month from December 1974 to June 1976, data were collected on (1) the number and type of aircraft onboard NAS Miramar, (2) their flight hours, and (3) the functions of the Air Operations, Aircraft Intermediate Maintenance (AIMD), and Supply Departments.

The number of air operations, rather than the number of flight hours, was chosen as the output measure for the Air Operations Department because flights of equal duration may impose different demands.[2] For example, one flight may take off and then land 1 hour later, accounting for 2 air operations, while another flight may practice 10 touch-and-go's after takeoff and still land 1 hour later, accounting for 12 air operations.

The structure of air operation demands on NAS Miramar was measured by analyzing three basic data sources: the NAS Miramar Pilot and Aircraft Status Report (PASR), the NAS Miramar Air Operations Department Function Summary Report (FSR), and the Instrument Flight Activity Reporting System (IFARS). PASR contains a monthly list of squadrons and aircraft onboard NAS Miramar. FSR lists total monthly air operations and categorizes them as specific flight functions, such as touch-and-go's, takeoffs and landings, etc. IFARS data were obtained from the Naval Safety Center, Norfolk, Virginia, and a record of all Navy flights (including hours, takeoffs, landings, full carrier landing practices, etc.) concerning NAS Miramar were extracted.

Man-hours expended on aircraft intermediate maintenance, rather than the number of Maintenance Action Forms, was selected as the output measure for AIMD. (The latter would only have been used if man-hour data were not identifiable by customer.) The structure of aircraft intermediate maintenance demands on NAS Miramar was measured through the use of the NAS Miramar Organizational/Intermediate Maintenance Monthly Maintenance, Material, and Management (3M) Summary (OIMS) report. OIMS lists total man-hours of repair and categorizes them by aircraft type.

The number of requisitions was chosen as the output measure for the Supply Department; this measure of supply workload is already accepted as the output measure for the Naval Supply Center, San Diego.[3] The structure of supply demands on NAS Miramar was measured by analyzing its Requisition Demand History (RDH) file and extracting a record of all requisitions or

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[2]An air operation is an event in which air traffic control service is provided to an aircraft. This definition is very important: since both takeoffs and landings are considered as separate air operations, each Field Carrier Landing Practice (FCLP)--which consists of a takeoff and a landing--is considered as two separate air operations.

[3]Blanco, T. Analysis of fleet and shore demands on the Naval Supply Center, San Diego (NPRDC Tech. Rep. 76TQ-39). San Diego: Navy Personnel Research and Development Center, June 1976. (AD-A035 589)

demands placed on Supply from December 1974 to June 1976. The data contain individual requisition transactions in which the demand customers are identified by unit identification codes (UICs).

Because these data sources permit an analysis of individual customer demand on NAS Miramar, the data can be used to determine (1) the feasibility of grouping aircraft by type, (2) the proportion of the total demand that is due to each aircraft type, (3) the differences in workload for different departments and different aircraft types, and (4) the change, over time, in demands made by aircraft customers. If all aircraft of one type have similar demand patterns, then the fleet can be represented by aircraft types in an I/O model and each type should have a final demand that is determined by the number of aircraft in the type. When the data are included in an I/O model with data from other activities, the importance of second- and higher-order effects can then be determined.

Initial processing of the data involved calculating the distribution of workload at the three major departments at NAS Miramar by aircraft type and shore customers.

Analysis of Demands

The analysis of demands on NAS Miramar focused on aircraft type and operating tempo (flight hours) as indicators of the source and intensity of demands. Average demand rates and standard deviations were calculated for each aircraft type and for each of the three major departments. This involved looking at 6 aircraft types and 322 individual aircraft.

Demand data were compiled for aircraft within a type by month. Air Operations demand rates were calculated by dividing the total number of air operations for each aircraft type during a month by the number of aircraft of that type that were onboard during that month. The average demand rate for the Air Operations Department is measured in terms of the number of air operations per aircraft onboard per month.

The number of flight hours per aircraft within a type during a given month was also calculated to provide a continuum between the analysis of air operations demand and the demands for aircraft intermediate maintenance and supply. The demand rates for intermediate maintenance and supply were calculated by dividing the man-hours expended on repair and the number of supply requisitions during a month by the total number of flight hours during that month for a given aircraft type. Average demand rates for intermediate maintenance and supply are measured in terms of man-hours of repair per flight hour and number of requisitions per flight hour, respectively.

RESULTS

As shown in Table 1, the proportion of total NAS Miramar manpower distributed to the three major departments remained relatively stable from FY75 to FY76.

Table 1

Distribution of Manpower by Major Department, NAS Miramar, FY75-76

Department	Proportion of Manpower (%)	
	FY75	FY76
AIMD	33	34
Supply	17	18
Air Operations	18	17
Total	68	69

Air Operations Demand

Initial processing of air operations data involved aggregating total demand by aircraft type. Most of the analysis used Instrument Flight Activity Reporting System (IFARS) data. The IFARS data represented 75 percent of the air operations as reported in Function Summary Report (FSR); the remaining 25 percent included demand imposed by civilian or other U.S. government aircraft.

Results indicated that aircraft from 326 Navy squadrons placed air operations demands on NAS Miramar from December 1974 to April 1976. However, the 32 squadrons home-based at Miramar during this time accounted for 91 percent of air operations recorded under IFARS. Consequently, the analysis of demand by aircraft type concentrated only on the Miramar-based squadrons.

Within the Miramar-based squadrons, the largest customer types of the Air Operations Department were the F-4, F-14, A-4, F-8, and E-2 aircraft, in that order. These five aircraft types accounted for 93 percent of total Miramar-based squadron demand on Air Operations. Table 2 displays the distribution of air operations demand from Miramar-based squadrons by aircraft type.

As indicated previously, average demand rates by aircraft type at Air Operations were measured in terms of the number of air operations per aircraft on board per month. Table 3 displays the average demand rates by aircraft type for Miramar-based squadrons. A comparison of means and standard deviations in Table 3 indicates that aircraft of the same type placed similar demands on Air Operations.

Table 2

Distribution of Air Operations Demand from Miramar-based Squadrons by Aircraft Type, December 1974 - April 1976

Aircraft Type	Proportion of Air Operations Demand (%)
F-4	36
F-14	20
A-4	20
F-8	9
E-2	8
Miscellaneous	7
Total	100

Table 3

Average Air Operations Demand Rates by Aircraft Type for Miramar-based Squadrons December 1974 - June 1976

Aircraft Type	Average Demand (Monthly Air Ops per Aircraft)	Standard Deviation	Months of Data
E-2	63.8	19.9	9
A-4	49.0	8.1	17
F-8	34.3	11.5	17
F-4	33.3	6.9	16
F-14	26.0	5.3	17

Table 3 shows the demands made on the Air Operations Department by major customers and will be used in the proposed I/O model for the sector reserved for NAS Miramar's Air Operations Department. These results do not include Field Carrier Landing Practice (FCLP) air operations. FCLPs were excluded due to their erratic occurrence; aircraft carriers are not always available for squadrons to do their carrier qualifications or predeployment carrier requalifications. The demand rate of FCLPs for aircraft assigned to Miramar (except for squadrons VC-7, VC-13, NFWS, VF-126, and OMD, which do not require carrier qualifications) was calculated to have a mean of 30.5 air operations/month/aircraft and a standard deviation of 11.7.

Table 4, also generated from IFARS data, is presented to establish a continuum between the results obtained for Air Operations and those obtained for AIMD and Supply. Since the outputs of the latter two departments are measured in man-hours of repair per flight hour and number of supply requisitions per flight hour, respectively, data on the number of flight hours by aircraft type are needed. Table 4 displays average flight hours per month per aircraft by aircraft type. Again, like the results for demand on Air Operations, aircraft of the same type had very similar flight-hour activity patterns.

Table 4

Average Flight Hour Activity by Aircraft Type for Miramar-based Squadrons December 1974 - June 1976

Aircraft Type	Average Flight Hours per Month per Aircraft	Standard Deviation	Months of Data
A-4	23.5	4.1	17
E-2	22.9	5.7	9
F-4	16.1	4.3	16
F-8	14.8	4.6	17
F-14	13.1	2.4	17

Aircraft Intermediate Maintenance Demand

Initial processing of AIMD data involved aggregating total man-hours of repair by aircraft type from OIMS reports. The five major aircraft types home-based at Miramar accounted for 75 percent of the total man-hours of repair done at AIMD, NAS Miramar; the F-14 and F-4 aircraft alone accounted for 55 percent. Table 5 lists the distribution of workload by category at AIMD from August 1975 to April 1977.

The four "other" categories listed in Table 5 make up 25 percent of the total AIMD demand. The Ground Support Equipment category includes tractors and aircraft starting units. The miscellaneous category includes repair work on the T-38 and F-5 aircraft of the Navy Fighter Weapons School and on the prop aircraft of the Operations Maintenance Department. An example of Type Equipment "Y" would be parachutes, and an example of Type Equipment "Z" is any equipment repaired that is not aviation-connected.

Table 5

Distribution of AIMD Demand by Category,
August 1975 - April 1977

Aircraft Type/ Category	Total Man-Hours of Repair	Proportion of AIMD Demand (%)
F-14	373,015	29
F-4	325,214	26
E-2	98,874	8
F-8	86,480	7
A-4	58,212	5
Ground Support Equipment	180,129	14
Miscellaneous	99,578	8
Type Equipment "Y"	37,955	3
Type Equipment "Z"	2,782	0
Total	1,262,239	100

As indicated previously, average demand rates by aircraft type at AIMD were measured in terms of man-hours of repair per flight hour. Table 6 displays the average demand rates of AIMD for the five major aircraft types home-based at NAS Miramar.

Table 6

Average AIMD Demand Rates by Aircraft
Type for Miramar-based Squadrons
December 1974 - June 1976

Aircraft Type	Average Demand (Man-hours of Repair per Flight Hour)	Standard Deviation	Months of Data
F-8	18.0	5.4	11
F-14	16.6	3.1	11
E-2	11.3	2.5	9
F-4	11.1	2.7	10
A-4	2.4	0.5	11

Table 6 clearly shows that different aircraft of the same type placed similar demands on AIMD. In analyzing the results, a comparison of the AIMD demands of the F-8, F-4, and F-14--three generations of Navy fighters--is in order. The mean demand rate on AIMD for the F-14 is 50 percent greater than that of the F-4. That result was expected because the F-14 is a much more sophisticated aircraft. These data also support the findings of the Navy's Visibility and Management of Support Costs (VAMOSC) study, which showed that intermediate maintenance costs were 34 percent higher for an F-14 than for an F-4 in FY75. The same study, however, showed the F-8 fighter to have 32 percent lower intermediate maintenance costs than the F-4 fighter. Thus, there is one glaring inconsistency in the results here--the F-8 has an average demand that is greater than both the F-4 and the F-14.

One possible explanation for this inconsistency is that, during the period covered by this analysis, a major policy change occurred with respect to the RF-8G--a reconnaissance modification of the F-8. Instead of being phased-out as planned, the use of this aircraft was extended. This policy change affected demands not only on AIMD but also on the Supply Department because aircraft were taken out of "mothballs" and made operational. This involved requisitioning new parts and reworking old parts.

Supply Demand

Initial processing of the Requisition Demand History file showed that the Supply Department had a demand of over 300,000 requisitions from December 1974 to June 1976. Initially, the demand was totalled by Unit Identification Code (UIC). The results are shown in Table 7.

Table 7

Total Demand by UIC on Supply, NAS Miramar
December 1975 - June 1976

Activity	Total Demand (Number of Requisitions)	Proportion of Supply Demand (%)
NAS Miramar	252,609	83
NAS Miramar Tenant Commands	29,039	10
Other Naval Air Stations	6,379	2
NARFs	3,340	1
Miscellaneous	12,603	4
Total	303,970	100

The demand by Miramar and its tenant activities represented 93 percent of the total Supply Department demand. Although 650 activities were drawing on Miramar Supply, only 163 of them averaged one or more requisitions per month and only 86 represented 98 percent of the total demand.

The NAS Miramar UIC accounted for a relatively large proportion (83%) of total requisitions because tenant squadrons use the Miramar UIC specifically to avail themselves of monies from the BP50 funds allocated to Miramar NAS. (Each such requisition with the Miramar UIC also has a 4-digit alphanumeric code that indicates the Miramar squadron, activity, or department actually requesting supplies.) For the purposes of this analysis, the demands by squadrons, activities, and departments were summed without respect to the funds against which the requisitions were drawn. The immediate analytic goal was to determine the monthly total demands made on Supply by the various squadrons, activities, and departments.

The procedure adopted for quantifying the demands on Supply was similar to that used in measuring demands on AIMD: average demand rates by aircraft type were measured in terms of the number of supply requisitions per flight hour. Table 8 displays the average demand rates at Supply for the five major aircraft types home-based at NAS Miramar and also for a miscellaneous category. Again, like the results for Air Operations and AIMD, aircraft of the same type are shown to have placed similar demands on Supply.

Table 8

Average Supply Demand Rates by Aircraft Type for Miramar-based Squadrons

Aircraft Type	Average Demand Rate (Requisitions per Flight Hour)	Standard Deviation	Number of Months of Data
F-8	2.7	1.0	17
E-2	2.1	0.5	9
F-14	1.8	0.5	17
F-4	1.7	0.4	16
A-4	0.6	0.1	17
Misc.[a]	0.9	0.2	17

[a]Consists of all aircraft of the Navy Fighter Weapons School (NFWS) and the Operations Maintenance Department, including NFWS A-4s whose demands (requisitions and flight hours) could not be isolated.

The ranking of aircraft types in terms of average requisitions per flight hour seems to reflect the sophistication and type of equipment in the aircraft. Similar to the results for AIMD, the F-8 had the highest average demand rate. This may be due to the aforementioned extension of the use of the RF-8G.

At the tenant activity and department levels, demand rates were broken down into the number of requisitions per month. The results for these classifications were tabulated and are shown in Table 9. Total supply operations are comprised mainly of support to AIMD, Air Operations, and Supply itself.

Table 9

Miramar Tenant Activity/Department Monthly Demand Rate

Tenant Activity/Department	Average Monthly Requisition Demand	Standard Deviation	Number of Months
AIMD	3792.4	412.6	18
Air Ops	721.6	258.3	18
Supply	204.8	171.7	18
Fleet Aviation Specialized Operational Training Group, Pacific Fleet Detachment	98.5	62.0	18
Commander Fighter/Airborne Early Warning Wing Pacific	87.1	40.2	18
Naval Air Maintenance Training Department	60.9	15.3	18

By looking at squadrons, tenant activities, and departments, it was possible to identify the primary customers and, eventually, the types of aircraft that the NAS Miramar Supply Department served. A portion of the supply operations, however, that defied attempts to identify the final customer was the 9 percent of total supply operations involving what are called "freebins." The freebins are stocked by Supply with small consumable items (i.e., nuts, bolts, gaskets, etc.) that are available to tenants on an "as needed" basis. On the requisitions, materials and parts in the freebins are identified by Miramar's UIC and Supply's 4-letter document serial number. These items are not paid for or charged to the tenant activities. Because the freebins were designed to facilitate the issue of small consumables, no requisition is required for materials issue and, consequently, no customer identification beyond "tenants" was possible for this study. To resolve this difficulty, an

initial accounting was made by number (Table 10). It is felt that customer-specific (hence, I/O usable) data can be generated to include this 9 percent of supply operations in the analysis.[4]

Table 10

Freebin Monthly Demand
December 1974 - May 1976

Freebin Number	Primary User	Average Monthly Requisition Demand	Standard Deviation	Number of Months
2	Power Plants, AIMD	284.4	164.8	18
3	Electronics, AIMD	346.4	235.2	18
4	E-2's	151.6	78.6	12
5	F-4's	219.5	109.8	18
6	A-4's, F-8's, AIMD	182.8	124.4	18
7	GSE, AIMD	11.0	30.5	18
8[a]	F-4's, A-4's	-0-	-0-	18
9	Air Frames, AIMD	108.4	56.2	18
10	F-14's	389.4	153.0	18

[a]Freebin #8 is a newly established bin for use by Reserve units with F-4 and A-4 A/C. Standard issuing procedure previously required a written requisition for all issues to Reserve units. When this freebin is stocked and starts being used, it will be the first freebin made available to Miramar Reserve units.

[4]A similar situation existed with respect to identifying the real customers of the ServMart operation at Naval Supply Center, San Diego, which is currently able to trace customers via an alteration in issuing paperwork at the various ServMarts. See Blanco, T. Analysis of fleet and shore demands on the Naval Supply Center, San Diego (NPRDC Tech. Rep. 76TQ-39). San Diego: Navy Personnel Research and Development Center, June 1976.

CONCLUSIONS

The analysis of demands on NAS Miramar permits some general conclusions on the feasibility of building an input-output (I/O) model of the fleet support demand network:

1. Data exist in the Naval Air Station system to measure aircraft demands on the three major departments at NAS Miramar--Air Operations, Aircraft Intermediate Maintenance, and Supply. Although these data will fit into an I/O framework, analysis of the data is laborious and time-consuming. Also, since most of the data sources are local Miramar reports, similar data sources may not be available at other Naval Air Stations. Thus, no statements can be made about the feasibility of analyzing demands on similar bases.

2. Using the output measures of air operations per month per aircraft for the Air Operations Department, man-hours of repair per flight hour for AIMD, and supply requisitions per flight hour for the Supply Department, it was shown that aircraft type and operating tempo (flight activity) significantly affected the workload at NAS Miramar. Therefore, an I/O model must not ignore the differences in workload attributable to an F-4 vs. an F-14, or to increases or decreases in flight hours.

3. The number of sectors that can be handled effectively in an I/O model is an important consideration. The 326 organizations with air operations at Miramar, the 255 AIMD customers, and the 650 Supply customers would pose a serious data management problem to the development of such a model. However, most of the demands can be represented by the Miramar-based squadrons, major departments, and tenant activities, which yield a much more manageable number of I/O model sectors.

4. The study showed that demands on the major departments at NAS Miramar were significantly affected by squadrons home-based there, and that demands on each department can be nicely aggregated by aircraft type. Therefore, it is hoped that, by including this knowledge, an I/O model will be able to quantitatively determine the influence of changing the mix of aircraft types home-based at NAS Miramar.

RECOMMENDATION

This analytic approach should be extended to include other major Naval jet aircraft bases, subject to data availability. To implement the Navy-wide input-output model, a close liaison with Commander Naval Air Force, Atlantic and Commander Naval Air Force, Pacific must be maintained to ensure an accurate representation of the Naval Air Stations.

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